

MUHLENBERGIA BRANDEGEI, A NEW SPECIES FROM
BAJA CALIFORNIA, MEXICO, AND ITS RELATIONSHIP
TO MUHLENBERGIA BILOBA

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Early in the year 1889, Townshend Stith Brandegee, botanist and plant collector, set out on the first of several expeditions into Baja California, Mexico. Leaving California by boat, he entered the peninsula at Magdalena Bay in mid-January and apparently spent about six weeks in this general area collecting the plants which he found there. In late February he was joined by two other naturalists from the California Academy of Sciences, Walter E. Bryant and Charles D. Haines. Shortly after the arrival of these men, the three colleagues visited Santa Margarita Island where they spent a week studying and collecting the flora and fauna. Santa Margarita, together with a sister island, Magdalena, lies just off the western coast of southern Baja California and these two islands form the seaward protection to Magdalena Bay. This was not only Brandegee's first, but apparently his only visit to Santa Margarita, an island which remains relatively little known botanically even today. General remarks concerning the trip and the collecting were published by Bryant (1889), his report being concerned principally with the bird life of the area. (For further details of the Brandegee itinerary see: Setchell, 1926; Ewan, 1942; Moran, 1952.) Brandegee, in 1889, published a list of the plants which he had collected early in that year, and in 1891 he described, in a general way, both Magdalena and Santa Margarita islands. One of the plants from Santa Margarita Island, a small annual grass listed by Brandegee (1889) as *Bealia mexicana*, is the subject of the present paper.

The geography and geology of these islands was discussed by Lindgren (1890) and Nelson (1921). Of chief concern to us here is a statement by Lindgren that the highest point on Santa Margarita Island is 1900 feet. Nelson (1921) devoted a small section of his account of "Lower California and Its Natural Resources" to the various coastal islands, and there is a short discussion of Santa Margarita. He indicates that the island is mostly barren and desert-like with little plant life. Such vegetation as does exist is primarily in the low middle area and is, for the most part, similar to that of Magdalena Island. He also notes that although these two islands lie close together and are relatively close to the mainland, nevertheless there are several forms of small mammals peculiar to Santa Margarita.

Although Brandegee (1891) entitled his second article, "The Plants Peculiar to Magdalena and Santa Margarita Islands," he included no list of species, but dealt with the geology and some phytogeographic relations of the plants of the area. Since, as he states, the rocks of the highlands of both islands differ in geological composition from those of the nearest mountains of the peninsula, he expected that there might be a

considerable number of local endemics even though the two islands are relatively close to each other and to the mainland. This, however, did not prove to be the case, as most of the plants appeared to be the same as those he had encountered in various parts of the peninsula. That there is some degree of endemism, however, is indicated by the fact that Brandegee found a few species, largely inhabitants of the rocks, that he had not collected elsewhere, and most of them proved to be undescribed.

Although he identified the major part of his collections himself, Brandegee sent some groups of plants to authorities for determination. George Vasey of the United States Department of Agriculture identified the Gramineae of the 1889 trip and his report was included by Brandegee (1889, pp. 210-214). Here Vasey placed "*Bealia mexicana* Scribner — Santa Margarita Island" between the species of *Muhlenbergia* and *Sporobolus*. This entry is made more conspicuous than the others by the footnote accompanying it:

(p. 212). "This grass was first collected by Mr. C. G. Pringle in Chihuahua, Mex., in October, 1886. It was named by Prof. F. L. Scribner, as a new genus, in honor of Prof. W. J. Beal, of the Michigan Agricultural College. I am not aware that a description has been published. It is considered by Prof. Hackel as forming, with *Clomena* Beauv., a section of *Muhlenbergia*. It appears to have pretty strong claims to specific [generic] distinction."

The inclusion with *Clomena* Beauv. was apparently based upon the fact that both possess a bidentate lemma which is awned from between the teeth. This character alone, however, is misleading, and the two complexes are not closely related. In *Bealia* both glumes are 1-nerved, while in *Clomena* the second is 3-nerved and 3-toothed. Beauvois (1812) realized this and stressed it in both his description¹ (p. 28) and in his figure (pl. 7, fig. 10). Species belonging to the *Clomena* complex include *Muhlenbergia peruviana* (Beauv.) Steud. and its close relatives.

The publication of the binomial *Bealia mexicana* apparently dates from Brandegee's paper (1889, p. 212) in which Vasey listed the grasses from Lower California. It should be noted, however, that it is here only a *nomen nudum*. Hackel (1887, p. 47) makes no mention of the genus *Bealia* in the text, although *Clomena* is included as a synonym of *Muhlenbergia*. In his "Nachtrag" (*op. cit.* p. 97), however, we find the following note:

"S. 47 zu *Muhlenbergia*: *Clomena* Beauv., wozu auch *Bealia* Scribn., bildet eine Untergattung mit 2zähliger, aus dem Einschnitte begrannter Decksp., in Mexiko und Peru."

¹ Beauvois states that the lower glume is tridentate, but this is obviously an error. His figure correctly shows that the first glume is entire and 1-nerved, while it is the upper (second) which is 3-nerved. Nilés (1925, pp. 162, 163) translates the Beauvois manuscript, but makes no mention of this discrepancy.

This addendum accounts for the comment inserted under *Muhlenbergia* in Scribner's translation of the Hackel manuscript (1890) and the subsequent consideration of *Bealia* as a synonym of *Muhlenbergia*. That Scribner did not agree with Hackel's disposition of *Bealia*, however, is evident from his comment in a footnote under *Muhlenbergia* on p. 104 of the translation. In this footnote Scribner discusses at some length the distinctions between that genus and *Bealia*, and ends with the statement: ". . . I can but consider it [*Bealia*] generically distinct." In this footnote the genus is described only superficially and no specimens are cited, but an original figure (45a) by Scribner shows the spikelet and its various parts in detail. The legend under the figure bears the name "*Bealia Mexicana*, Scribner (provisional)."

It was not until six years later that an adequate description of *Bealia mexicana* was published, and this by Beal (1896, pp. 267, 268) himself, although he credits the name to Scribner. In the same publication Beal makes the new combination *Bealia speciosa* which is based on *Muhlenbergia speciosa* Vasey. These two specific epithets are the only ones which have ever been associated with the generic name *Bealia*. Our present concern is only with *Bealia mexicana*, since *B. speciosa* appears to be a valid Mexican perennial species of *Muhlenbergia* (see Hitchcock, 1935, p. 457).

In the amplified diagnosis of *Bealia mexicana*, Professor Beal states that the plant is "an elegant tufted perennial, 20–40 cm. high." A Pringle specimen (no. 819) from the State of Chihuahua, Mexico, is the only collection cited. Actually specimens of this collection, which are still extant, show that the plants were certainly annual in growth habit.

The chief characters which served to separate *Bealia* from *Muhlenbergia* were the deeply bifid lemma, between the lobes of which an awn arises, as well as the long, faintly-nerved glumes, which commonly exceed the lemma in length. These characters are present also to a greater or less degree in those *Muhlenbergia* species which are sometimes recognized as the distinct genus *Epicampes* Presl, all of whose species are stout perennials. Despite its annual habit, if *Bealia mexicana* were not to be recognized as a member of the genus *Muhlenbergia*, it would appear to belong to the genus *Epicampes*, a disposition which was made of it by M. E. Jones (1912). At present, however, *Bealia* is not recognized, and *Epicampes* usually is considered as little more than a section of *Muhlenbergia*.

Hitchcock (1913), reporting on the Mexican grasses in the United States National Herbarium, attempted to clarify the situation by (1) transferring *Bealia mexicana* to *Muhlenbergia*; (2) pointing out that the combination *Muhlenbergia mexicana* was not tenable since the epithet *mexicana* had been preempted in the genus by *M. mexicana* (L.) Trin. in 1824; (3) proposing a substitute name, *M. biloba*; and (4) citing the collections then presumed to represent the species, which included the type (*Pringle 819*) from Chihuahua; *Pringle 10147* from Durango; and *Brandege* in 1889 from Santa Margarita Island.

In a later work, Hitchcock (1935, pp. 436, 437) gave the type locality as "Chihuahua City, (Pringle 819)" and the distribution as "Gravelly hills, Baja California to Durango."

I. M. Johnston (1943), apparently following Hitchcock's lead, said of *Muhlenbergia biloba*: "Known from a few stations in Baja California, Chihuahua, and Durango."

Conzatti (1946) in his "Flora Taxonomica Mexicana," evidently following Hitchcock, includes *Muhlenbergia biloba* and cites the same three localities. It is interesting to note that Conzatti, in the synonymy, gives the impression that *Bealia mexicana* Scribn. ex Beal (1896) is based on *Muhlenbergia mexicana* (L.) Trin. This, as we have seen, is not true; rather, it is the reason for the new binomial.

Pringle collected many replicates and consequently his specimens are distributed rather widely. The Brandegeee collection, on the other hand, apparently was more restricted, and to my knowledge specimens are to be seen in only two herbaria.

In addition to the three collections cited by Hitchcock as *Muhlenbergia biloba*, there is yet a fourth, overlooked by most authors, but brought to my attention by an entry in Pringle's journal (Davis, 1936, p. 36):

"Oct. 7, (1886). A great day for us. Rising at daybreak at 6:40 A.M. we were on our way to the northwestern hills. There we secured two species of *Cyperus*, 811 *C. amabilis* Vahl and 810 *C. Hochstetteri* Nees, and a large supply of a strange grass of which last year I found but two specimens in a wash — 819 *Bealia mexicana* Scribner."

In the itemized list of Pringle's specimens (Davis, 1936, p. 340), there are three separate numbers given under *Bealia mexicana*. In addition to 819 (type) and 10147 (cited by Hitchcock, 1913), there is a third, 501. A sheet in the Pringle Herbarium bearing this number (501), which I have examined, contains two small plants. This collection, which is from the same general locality as the type, is apparently that referred to by Pringle in the quotation above and thus represents all of the material of this species which he found in 1885. While all of the Pringle collections appear to be conspecific, the one from Durango (10147) differs slightly from the other two. It has longer hairs on the glumes, shorter hairs on the palea, and the glumes and floret are about equal in length. These slight differences, however, seem to be well within the range of variability of the species.

While the specimens from Chihuahua and Durango are certainly conspecific, the Brandegeee collection from Baja California, even though apparently related to *Muhlenbergia biloba*, differs in morphological details which appear to be of such a magnitude as to represent a distinct species. The geographical ranges of the two taxa moreover appear to be quite distinct. Since a new specific epithet is required, I should like to name this new taxon in honor of the collector, T. S. Brandegeee, a Yale alumnus, who did so much to further the botanical knowledge of Mexico and California.

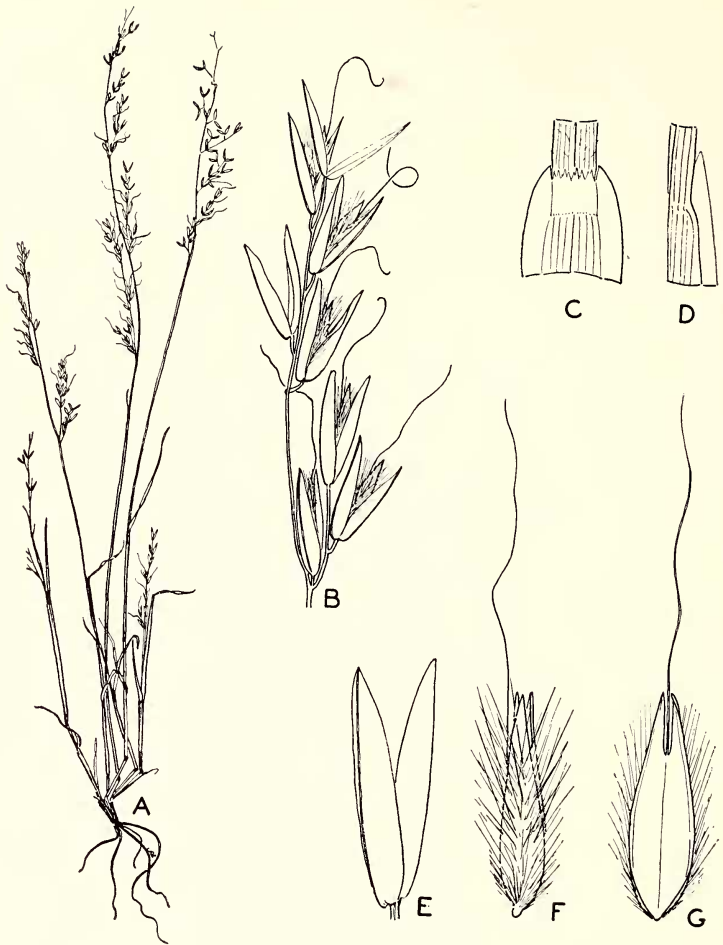


FIG. 1. *Muhlenbergia Brandegei* C. G. Reeder. A, habit, $\times \frac{1}{2}$; B, panicle branch with spikelets; C and D, two views of ligule (B-D, $\times 5$); E, glumes; F, floret; G, lemma flattened out, adaxial view (E-G, $\times 10$). From type specimen (*Brandegee 16* in 1889).

***Muhlenbergia Brandegei* sp. nov.** Annuæ, 15–25 cm. alta; culmis teretibus purpureis striatis plus minusve glabris erectis vel adscendentibus, nodis glabris fuscis inferioribus multiramulosis; vaginis glabris vel minute scabris quam internodiis plerumque brevioribus, marginibus scariosis; ligule membranacea erosa circiter 0.7–0.8 mm. longa sed marginibus in dentes subulatos ad 1.5 mm. longis extendentibus; laminis planis vel apicem versus plus minusve subinvolutis 3–4 (raro ad 7) cm. longis 1–1.5 (raro ad 2) mm. latis, subtus scaberulis, supra sparsim pubescentibus; panicula contracta pallido-viride 3–10 cm. longa, rhac. *a, ramis

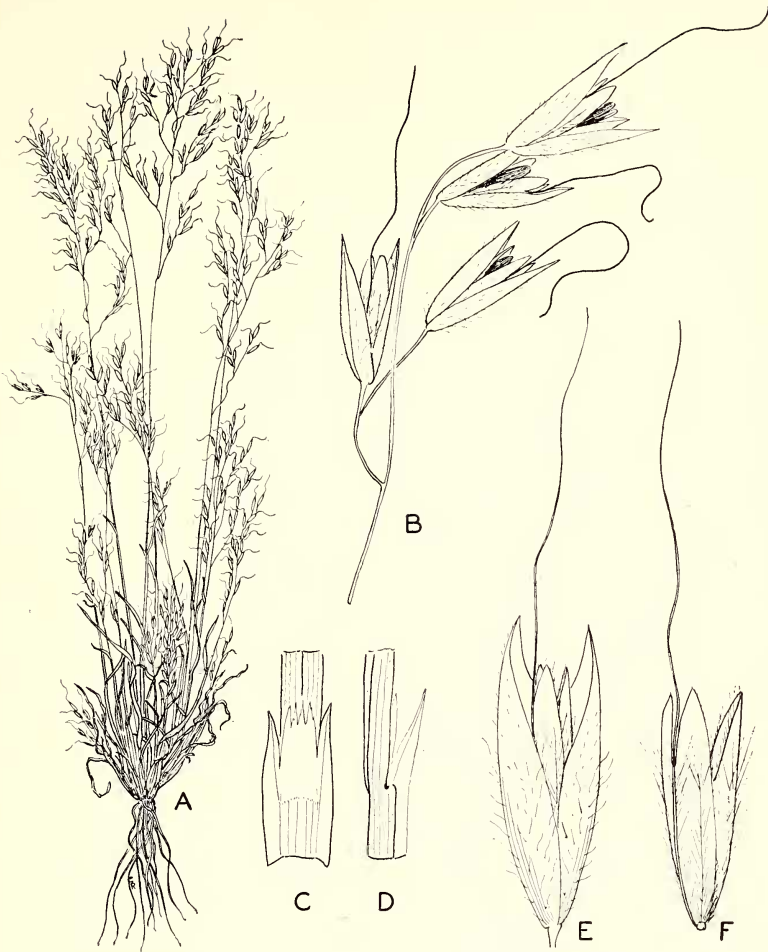


FIG. 2. *Muhlenbergia biloba* Hitchc. A, habit, $\times 1/2$; B, panicle branch with spikelets; C and D, two views of ligule (B-D, $\times 5$); E, spikelet; F, floret (E-F, $\times 10$). From type collection (Pringle 819).

adscendentibus e base plerumque densifloris; pedicellis angularibus adpressis 1-3 mm. longis; spiculis circiter 3 mm. longis; glumis subaequalibus 1-nerviis plus minusve glabris sed sub lente minute papilloso-asperis; lemmate circiter 2.5-2.8 mm. longo quam glumis paullo brevior dense pubescente (pilis albis rigidis basim versus brevibus apicem versus gradatim longioribus), apice acuminato bifido, dentibus ad 1 mm. longis; arista flexuosa scaberula 7-8 mm. longa e apice lemmatas bifida exserta; antheris circiter 1 mm. longis; caryopsis 1.4 mm. longa.

LOWER CALIFORNIA, MEXICO: Santa Margarita Island, T. S. Brandegee 16 (UC type; US). March 6, 1889.

TABLE 1. SUMMARY OF CHARACTERS DISTINGUISHING MUHLENBERGIA BILOBA FROM *M. BRANDEGEI*

	<i>M. Brandegei</i> (see fig. 1)	<i>M. biloba</i> (see fig. 2)
Glume length	3 to 3.5 mm.	4 to 5 mm.
Glume surface	glabrous (minutely papillose-roughened under a lens)	pubescent, especially on the lower $\frac{2}{3}$
Glume nerve	prominent, green	indistinct
Lemma length (including teeth)	about 2.5 to 2.8 mm.	3 to 3.5 mm.
Lemma surface	densely stiff pubescent on lower $\frac{1}{2}$ to $\frac{2}{3}$'s; hairs white, short below, longer above	sparsely appressed tawny pubescent on about lower $\frac{2}{3}$
Lemma teeth	acuminate to aristate, erect	\pm rounded, broadly toothed, spreading
Lemma nerves	3 prominent, the nerves evident even in the teeth when opened out	1 prominent, the lateral nerves indistinct above, more evident on lower $\frac{1}{2}$
Anther length	1 mm.	2 mm.
Pedicels	angular	terete
Panicle	contracted, branchlets and pedicels stiffly appressed along the axis; the main branches ascending or appressed, mostly spikelet-bearing for entire length	somewhat open, with branchlets and pedicels ascending to spreading, \pm flexuous; spikelet-bearing on terminal half
Ligule length	1 to 1.5 mm.	2.5 to 3 mm.
Flowering time	March (plants mature)	September and October
Distribution	Baja California: Santa Margarita Island. Not over 1900 feet elevation	Chihuahua and Durango, in the mountains, elevation from 4700 to 6800 feet

As pointed out above, *Muhlenbergia Brandegei*, which appears to be endemic to Santa Margarita Island, has been confused with *M. biloba* Hitchc. from the time of its discovery. For this reason, the complete synonymy of *M. biloba* is given below, along with a list of the specimens examined. I believe that this short list represents all the collections that have been made of this species.

MUHLENBERGIA BILOBA Hitchcock, Contr. U. S. Nat. Herb. 17: 294. 1913; N. Am. Fl. 17 (6): 436. 1935. *Bealia mexicana* Scribner ex Vasey, in Brandege, Proc. Calif. Acad. Sci. II. 2: 212. 1889, *nomen*; in Scribner & Southworth, The True Grasses p. 103, fig. 45a. 1890, *nomen*; ex Beal, Grasses N. Am. 2: 267. 1896, descr. [basis of *Muhlenbergia biloba* Hitchc.]. *Epicampes mexicana* (Scribner ex Beal) M. E. Jones, Contr. West. Bot. 14: 7. 1912. Not *Muhlenbergia mexicana* (L.) Trin. 1824.

Specimens examined: MEXICO. CHIHUAHUA: [vicinity of Chihuahua City], thin soil of porphyry mountains, October, 1886, *Pringle 819*, US (type), F, GH, MO, NY, VT, UC (not seen), YU; hills west of Chihuahua, October 21, 1885, *Pringle 501*, VT; Majalca [north of Chihuahua City], September 16, 1935, *Le Sueur Mex-026*, CAS (not seen), GH, MO, UC, US. DURANGO: Barranca below Sandia Station, 6800 feet elevation, October 12, 1905, *Pringle 10147*, CAS (not seen), F, MO, NY, UC (not seen), US, VT. [According to Davis (1936, p. 228) on October 12, 1905, Pringle was on the Mesa de la Sandía at the base of the Sierra Madre Range.]

Although *Muhlenbergia biloba* and *M. Brandegei* resemble each other in certain characters, they are apparently not as closely related as was once supposed. The important differences are summarized in Table 1.

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LITERATURE CITED

- BEAL, W. J. 1896. Grasses of North America. New York: Henry Holt & Co. Vol. II. The grasses classified, described, and each genus illustrated, with chapters on their geographical distribution and a bibliography. pp. viii + 706. illus.
- BEAUVOIS, A. M. F. J. PALISOT DE. 1812. Essai d'une Nouvelle Agrostographie; ou Nouveaux Genres des Graminées; avec figures représentant les Caractères de tous les Genres. Paris. pp. lxxiv + 145. illus.
- BRANDEGEE, TOWNSEND S. 1889(1890). A collection of plants from Baja California, 1889. Proc. Calif. Acad. Sci. II. 2: 117-216.
- . 1891. The plants peculiar to Magdalena and Santa Margarita Islands. Zoe 2: 11-12.
- BRYANT, WALTER E. 1889(1890). A catalogue of the birds of Lower California, Mexico. Proc. Calif. Acad. Sci. II. 2: 237-320.
- CONZATTI, CASIANO. 1946. Flora Taxonomica Mexicana (Plantas Vasculares). Tomo I.: Clave analítica de familias Pteridofitas o Helechos, Monocotiledoneas monaperiantadas. Mexico, D. F.: Sociedad Mexicana de Historia Natural. xxxv + 378. (Grasses pp. 148-327.)
- DAVIS, HELEN BURNS. 1936. Life and work of Cyrus Guernsey Pringle. Burlington, Vermont: University of Vermont. 756 pp. illus.
- EWAN, J. A. 1942. Bibliographical miscellany—IV. A bibliographical guide to the Brandege botanical collections. Am. Midl. Nat. 27: 772-789.
- HACKEL, E. 1887. Gramineae (echte Gräser). In Engler, A. & K. Prantl, Die natürlichen Pflanzenfamilien. Leipzig. 7(2): 1-97. illus.
- HITCHCOCK, A. S. 1913. Mexican grasses in the United States National Herbarium. Contr. U. S. Nat. Herb. 17(3): 181-389. + index. (See pp. 294-295.)

- . 1935. (Poales) Poaceae (pars). N. A. Fl. 17(6): 419–482. (See pp. 431–432.)
- JOHNSTON, I. M. 1943. Plants of Coahuila, Eastern Chihuahua, and adjoining Zacatecas and Durango, II. Jour. Arnold Arb. 24: 375–421.
- JONES, M. E. 1912. New species and notes. Grass notes. Contr. West. Bot. 14: 1–21.
- LINDGREN, WALDEMAR. 1890. Notes on the geology and petrography of Baja California, Mexico. Proc. Calif. Acad. Sci. II. 3: 25–33.
- MORAN, REID. 1952. The Mexican itineraries of T. S. Brandege. Madroño 11(7): 253–262.
- NELSON, EDWARD W. 1921. Lower California and its natural resources. Mem. Nat. Acad. Sci. 16(first Memoir): 1–171. pl. 1–35.
- NILES, CORNELIA D. 1925. A bibliographic study of Beauvois' Agrostographie. Contr. U. S. Nat. Herb. 24(6): 135–214. + index.
- SETCHELL, WILLIAM A. 1926. Townshend Stith Brandege and Mary Katherine (Layne) (Curran) Brandege. Univ. Calif. Publ. Bot. 13(9): 155–178. pl. 13, 14.
- SCRIBNER, F. LAMSON & EFFIE A. SOUTHWORTH. 1890. The true grasses. Translated from Hackel, Eduard. Die natürlichen Pflanzenfamilien. New York: Henry Holt & Co., viii + 228. illus.

PHYTOSEROLOGY VERSUS GENEALOGY IN ZEA MAYS¹

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For many years the ideas of phytoserology, as expounded by Mez (1936) and by Chester (1937), have intrigued the senior author as being potentially highly significant in the field of plant taxonomy. Discussions with the junior author, and with his colleague, Dr. Warren Engelhard, stimulated a desire to attempt some phytoserological tests. While it is obvious from the literature that phytoserology has yielded taxonomic data, (i.e., data which give evidence of proximity of relationship), there is no assurance that these data are valid. In short, do the data obtained from serological studies accurately reflect the genealogies of the individuals in question? This was our problem.

In order to set up a test for the validity of phytoserology in taxonomy, it was necessary to find plants of *known* genetic (genealogical) relationships. It was felt that checking members of the same genus against members of other genera in the same plant family, or against members from other families, would not be accurate enough, since such relationships are *assumed*, not definitely known. It is true that such assumptions are based upon many data, and are probably valid, but the authors wished to test definite, not probable, genealogies. With the thought that *Zea Mays* had been bred for many years, the authors approached the corn breeders to see if they could obtain some strains of known genealogy. Many of their stocks were of *presumed* closer or more distant relationship, but the genealogies of some were *known*.

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